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What Is the Future of Inland Water Transportation?

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There are here presented the results of a thorough study to determine the present economic position of inland water transportation, the field which it should occupy with relation to railway transport, and the consequent policy which should be adopted by the Government with reference to waterway development.

The investigation shows that traffic on nearly all inland waterways has all but disappeared. With few exceptions, the competition of waterways with railways is no longer of any consequence. The primary cause of the decline of the waterways is the extraordinarily low cost at which the railways of the United States are able to handle low-grade bulk freight, which is the only class of freight on which the waterways can hope to compete with railways.

The widespread belief in the great advantage of waterways, and the stock arguments in their favor, are fairly examined and are found to be based on conditions of the past, not those of the present.

The waterway was the only cheap means of transportaion before the railway came, and the invention of the steamboat multiplied the value of the waterway many times.

It was not until the railway had experienced a half century of development and the invention of the steel rail had made possible the use of heavy rolling stock that low-cost. railway transport became possible.

In the battle between rail and water routes during the last quarter of the nineteenth century, public sympathy was strongly enlisted on the side of the waterway because it represented free competition as opposed to monopoly. The belief in the value of potential water competition to keep down railway rates has been almost universal. Government control of the railways has now demonstrated the fallacy of this belief.

The recent great increase in labor costs has hit the water carriers, notably coastwise steamers, much harder than the railways.

Recent attempts to revive water transportation on the Mississippi and Missouri Rivcrs and the New York Barge Canal, first by private enterprise and now by the Federal Government, have all resulted in heavy loss. Ie has become evident that there is not sufficient profit in water transport to attract capital, even though the taxpayers bear the entire cost of making and maintaining the channels used.

The only waterways which promise public benefit are those where terminal expenses favor the waterway instead of the railway. A deepened St. Lawrence River connection between the lakes and the Atlantic and a ship canal across New Jersey are the two waterway projects which best deserve attention.

I—Introduction—The Government's Policy Toward Inland Waterways

WHAT is the proper place of the navigable river and the canal in the country's transportation system? Can the steamboat and the barge compete with the railway train? If so, where and under what conditions? Should the United States continue to spend great sums improving rivers for navigation?

These questions are of pressing importance. There is on the one hand widespread belief among business men in the future of water transportation. The Chamber of Commerce of the United States adopted a waterway plank at its annual meeting in St. Louis in April, reading:

"We urge that the Government speedily complete river improvement projects already authorized, and that Congress provide for a comprehensive system of waterways with coördination of the services of waterways and railroads."

On the other hand, the public has become informed as to the practical failure of the Federal waterway improvement program. It is no secret that the annual river and harbor appropriation bill is commonly known as the "pork barrel" bill. Repeatedly on the floor of Congress has the wholesale waste in the Government's river and harbor work been exposed and condemned. Even the Presidential veto has at times been interposed, when the objectionable items in these bills became too scandalous.

The present is an opportune time to stop this waste. Drawing funds from the public treasury ostensibly for the improvement of navigation but really for flood protection, to benefit private interests, or to obtain the expenditure of Federal money in certain Congressional districts, is obtaining money under false pretenses. The nation can no longer afford, with the easy-going indifference of the past, to allow this waste to proceed unchecked. With a vast burden of war debt and huge continuing expenditures to remain long with us as a result of the war, rigid economy in national outlay is imperative.

Government Lavish in Its Waterway Work

The United States has spent many millions of dollars on inland rivers, and that, too, within recent years, where no navigation of any consequence now exists. It has built dams and locks on rivers where the only water traffic now is the floating of logs, and these went down stream more readily with the river in its original condition than with the navigation improvements. Surely it is time to stop such waste. Whatever sums the nation is to spend on waterway improvements should be concentrated on channels where the business will be sufficient to warrant the outlay. Scattering Federal money on all sorts of waterway projects, good, bad and indifferent, is an injury to the water transportation interests, not a benefit.

Waterway advocates have long asserted that the decadence of water transportation is due to the nig-

gardly policy of the Federal Government regarding the inland waterways. How baseless is this assertion may be judged from the fact that the Federal Government has spent to the present time nearly a billion dollars[1] on river and harbor improvement, fully half of which has been devoted to inland waterways. In addition, over $300,000,000 has been spent by the states and by private corporations on inland canal construction. Most of these canals long ago became obsolete and were abandoned, though the one on which over half of the sum was spent, the New York Barge Canal, has only just been completed.

It may be supposed that the above-quoted figures for Government expenditures on waterways represent money spent many years ago, when inland water transportation was in its prime. The fact is, however, that fully half of all that the Federal Government has spent on river and harbor work has been spent within the past 15 years. Even on canals, the State of New York has spent within the past 15 years on its canal system two-thirds as much as all the outlay on all the canals in the United States previous to 1900.

In the face of this lavish expenditure on waterway improvement, inland water transportation has been steadily declining for many years. This is true not only of the smaller navigable streams but of the great rivers, including what was once the most important inland river transportation route in the United States, the Mississippi River.

The river steamboats on the Mississippi reached their climax of prosperity in the '70s. By 1890 the railways had shot so far ahead in the competition that St. Louis, the center of the river-borne commerce of the Mississippi valley, received 15 times as much freight by rail as by river steamboat. Statistics gathered by the St. Louis Merchants' Exchange show that in 1890 St. Louis received 663,730 tons of freight by river and shipped 601,862 tons. Sixteen years later, in 1906, the receipts at St. Louis by river had fallen to 327,670 tons and the shipments to 89,185 tons. During the same period the freight receipts by rail at St. Louis grew from 9,969,000 tons in 1890 to 27,292,000 tons in 1906. The rail shipments from St. Louis increased from 5,270,000 tons in 1890 to 17,672,000 tons in 1906.

Thus, while 30 years ago the receipts of freight by rail at St. Louis were 15 times as great as the receipts by river, a dozen years ago the river receipts had fallen to only 1% of the receipts by rail and the shipments by river were less than 0.50% of the shipments by rail.

There was, however, a widespread belief a dozen years ago that river transportation had reached its lowest ebb and that its revival might be confidently expected. Instead of that, the decline has continued. In 1918 St. Louis received 42,318,000 tons of freight by rail and only 60,450 tons by river. There were shipped out of the city 30,097,000 tons by the railways and 69,045 by the river. Thus, the steamboat commerce of St. Louis in the whole year of 1918 did not equal the railway commerce of half a day.

The few steamboats which still remain on the Mississippi and some of its tributaries are no longer competitors with the railways for through traffic. They are handling a small amount of local business only, on which the boat can for some special reason serve the shipper better than can the railway.

[1]The total of all Federal appropriations for river and harbor work, to July 18, 1918, was $971,142,916.

Meanwhile, the United States has gone on with its program of waterway improvement, and has spent money on inland rivers more lavishly during the past dozen years than ever before. The question whether the commerce which will use the improved channel will be sufficient to justify the expense is apparently a purely academic question in which no one in authority takes any interest. When a project is once officially adopted it is carried to completion even though the plans for it become obsolete during the preliminary stages.

The Hennepin Canal

A good illustration of the Government's conduct of its river and harbor work is the once famous Hennepin Canal in northern Illinois. This waterway was originally projected more than half a century ago as a short connection from the upper Illinois River to the Mississippi River. At that time river navigation was still a very active business in the central West. Waterways to compete with railways and cut down railway rates were being actively promoted. Elaborate computations were made to prove the great public benefit which the Hennepin Canal would confer in forcing the reduction of railway rates over a wide territory.

Very likely there was enough foundation for these claims, at the time when the project was first agitated, to bring about the exertion of railway influence, then powerful at Washington, to delay action by Congress. At any rate, there was a long period of inaction before the project was formally undertaken. Once started, the work proceeded at the leisurely pace usual on Government works. The river steamboat business, for whose benefit the canal was undertaken, dwindled away, but no one in authority paid any attention to that.

After something like a score of years spent in construction, the canal was opened for business in 1907. It had cost the Government $7,566,000. There has been expended on it since, for maintenance and operation, $1,716,000. The total traffic on the canal for the past five years has averaged only 12,060 tons per annum. Here is a total investment by the Government approximating $10,000,000, plus over $90,000 a year paid out in operating expenses, all to accommodate as much business in an entire year as is carried in a single day over many of the railway lines in the same district. The fourteen locks on the canal must be continuously tended even though the solitude of the lock tenders may be disturbed only once a month by a passing boat.

And yet the case of the Hennepin Canal is not quite so bad as that of some of the other Government works for the benefit of river navigation. At the Hennepin Canal there is at least a lot of well-built masonry structures to serve as a monument for the $10,000,000 expended. There are rivers on which great sums have been spent by the United States, and nothing is left now to show for it. Floods have swept away all vestige of the work done; and the commerce which the work was undertaken to benefit has never materialized.

The public is familiar with charges of gross waste in the conduct of Government business; and the common idea is that the waste is due to dishonesty or inefficiency on the part of Government employees. But the above examples well illustrate the fact that *the chief source of waste in the public business is lack of intelligent planning.* The rank and file of Government employes can carry on routine work very well. They can build a Hennepin Canal when the work is ordered, and

make a good job of it. What is lacking is someone with enough intelligence and authority to determine which works are worth while to undertake and which are not, and with the courage, when a mistake has been made, to stop the throwing of good money after bad.

If one inquires the reason why the blind expenditure on waterways has gone on so long almost unquestioned, an answer is found in the fallacious ideas which are so widely held regarding water transportation. A voluminous literature has been circulated for many years, devoted to the advocacy of water transportation. Much of it is the work of writers gifted with enthusiasm but ignorant of the foundation engineering and economic facts respecting modern transportation methods. Many of these writers have been employed to advocate a cause, not to deal with the subject from a professional and unprejudiced point of view.

Practically the whole of this voluminous advocacy of waterways, in books, pamphlets, newspapers and public meetings—and even engineering treatises—rests upon the assumption that water transportation is cheaper than railway transportation. The time has come for an unprejudiced inquiry as to whether this assumption is correct.

II—A Century of Transportation Development

For a clear understanding of the present relations of water and rail transport, nothing can better aid than a brief review of the past century of transportation development. The revolutionary changes in transportation during the past hundred years have transformed the world to a degree that we of the present generation, who have always been accustomed to the conditions created by steam power transport on land and sea, find difficulty in comprehending.

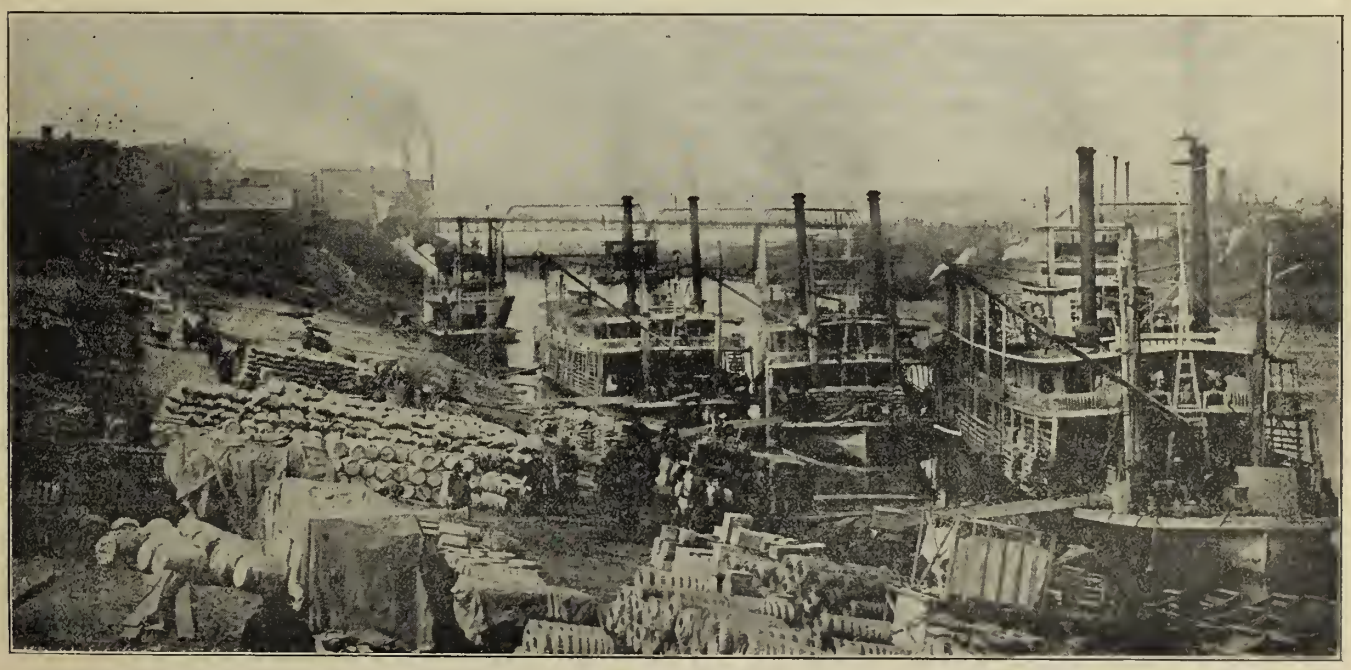
At the beginning of the nineteenth century the art of transportation was in the primitive conditions that had prevailed for ages. The sole power available for land transport was man or animal muscle. On the water this had long been supplemented by one of the great powers of nature, the wind. This was available only for the ocean and other open waters; but inland the rivers were and had been from earliest times the chief highways for freight transport. A horse or man could pull many times as heavy a load on a barge floating on the water as on a cart. Not only such rivers as are now called navigable, but any stream large enough to float a rowboat, was then a better means of freight transport than a road on land.

The Gallatin Report of 1808

The vital importance of economical transportation in advancing the public welfare was fully realized by the statesmen of a century ago. In 1808, Albert Gallatin, secretary of the treasury, made a report on roads and canals which is famous as embodying the first comprehensive plan for carrying out public works by the Federal Government. The Gallatin report made no mention of steam transportation, although an appendix contained a letter from Robert Fulton, who had made his successful voyage with the "Clermont" a year earlier. Gallatin proposed a chain of canals along the Atlantic coast to connect inland tidal waters. Canals across the Appalachian mountains to connect the Atlantic coast rivers with the rivers of the Ohio basin he concluded to be impracticable. Hence he advised that "artificial roads" should be built across these mountains to connect the navigable rivers on each side.

How small and primitive was the water transportation of that day may be realized from Gallatin's references to the few canals then completed. The James River Canal at Richmond could pass boats of eight tons drawing 3 ft. of water. The canals along the Mohawk River were 2½ ft. deep and passed boats of 10 tons. The greatest canal work in the United States was the Middlesex Canal in eastern Massachusetts, connecting the Merrimac river with the harbor of Boston. This canal could pass boats of 24 tons; "but those in most general use are of smaller dimensions and are drawn by two horses at a speed of three miles an hour."

Practically all the work then being done on rivers and canals and on turnpike construction was by incorporated companies, and the financial results were, almost



TYPICAL WESTERN RIVER STEAMBOATS AT A LANDING, SHOWING COSTLY METHOD OF HANDLING FREIGHT

without exception, disappointing. Gallatin recommended that the Federal Government should undertake the construction of canals and highways and the improvement of navigable rivers, covering all the territory embraced in his report. He estimated the total cost at only $20,000,000, and continued:

"An annual appropriation of $2,000,000 would accomplish all these great objects in 10 years and may, without inconvenience, be supplied in time of peace by the existing revenues and resources of the United States."

Verily, those were the days of small things.

It is difficult to realize fully today what Fulton's invention meant to the world at the beginning of the nineteenth century. The railway was not yet born; good highways were almost unknown. There had never existed in the world such a thing as cheap inland transportation. The population of all civilized countries was therefore concentrated near the seacoast, where water transportation was available. It was impossible to fill with people the great fertile plains in the interior of the continents, such as the valley of the Mississippi, because of the lack of transportation. Although two centuries had passed since the first European colonies were established in what is now the United States, only the region along the Atlantic coast had been occupied.

Crude as were the first steamboats, they were so great an advance over any previous means of inland transport that they were put into use with marvelous rapidity. The rivers had always been the chief arteries of traffic, and now steam power could replace human muscle in the propulsion of boats. For more than twoscore years the steamboat was the prime factor in the development of the Middle West.

The Railway Era

The railway era began in 1825, when George Stephenson's famous locomotive, "Rocket," made its successful trial trip. The river steamboat and the canal boat were then well established. The same year that saw the birth of the railway witnessed also the completion of the Erie Canal by the State of New York. The importance of that waterway at that day in affording a cheap means of transportation between the central West, and the Atlantic coast, by connecting the Great Lakes and the Hudson River, it would be difficult to overestimate.

Stephenson's locomotive was built for high speed, not hauling power. Passenger and express business was the aim of the early railway promoters. They did not expect to compete with the river and canal for freight business; and the early railways were in fact too light and of too small capacity to move freight economically. These early railways were also very costly to construct and to operate. For the light traffic of the pioneer days, the river steamboat, operating on a road which nature had provided without cost, had no fear of railway competition. For the first three decades of the railway era, capital and labor were fully occupied in building railways in the thickly settled Atlantic coast states. The pioneering of the West had to wait.

Those were the halcyon days of the river steamboat. The Mississippi River and all its chief tributaries, where depth of water made navigation at all possible, were traversed by steamboats which were until the Civil War the chief and often the only means of transport. Not till a decade after the war did the decline of the Mississippi steamboat become evident.

In the Eastern states it was found at an early date that the railway had great advantages over the little artificial canals and over navigation on difficult rivers. The abandonment of the early Massachusetts canals followed closely on the coming of the railway. Year by year the railway became a more efficient means of transport; but its period of great development really began when the Bessemer steel rail began to displace the wrought-iron rail. The growth in size of cars and locomotives had been hitherto restricted by the rapid wear of the soft-iron rails. Bessemer's invention made possible that development of the railway as an economical freight carrier that has since taken place.

The Battle Between Rail and Water Routes

Before the coming of the steel rail, the battle between the railway and the steamboat had become active. Public sympathy, at first enthusiastic for the railway, had been enlisted on the side of the steamboat. Those pioneer railway lines were risky ventures, and the men who controlled them sought to make all the profits possible. They charged "what the traffic would bear," and few were prepared to deny their right to do so. The protest against this policy brought about the Granger agitation and legislation of the early '70s, which sought to establish just such control over railway transport and rates as was actually put in force half a century later.

At that time, few public men were bold enough to advocate direct Government control of railways. Sentiment was rather in favor of keeping alive competition, and especially competition by water routes. In 1872 a Senate committee headed by William Windom of Minnesota, who was later Secretary of the Treasury, made a remarkable report on transportation. After recommending legislation for Federal railway control on substantially the lines actually enacted in the first interstate commerce law 15 years later, the committee declared that "water routes when properly located not only afford the cheapest and best known means of transport for all heavy, bulky and cheap commodities, but they are also the natural competitors and most effective regulators of railway transportation."

The committee therefore recommended a system of water routes designed to carry the products of the Central West to the seaboard. Under the conditions then existing the recommendations were justified. At that time the average railway freight on a bushel of wheat from the Mississippi River to New York was 50c. A large part of the corn crop of the Middle West was not marketed because it could not stand the transportation charges. With the equipment and facilities and volume of traffic then prevailing, however, the railways in order to live were compelled to charge rates which today appear high.

Those were the days of sharp competition of railways with one another and of railways and water routes. Rates were made to meet competition as a matter of course. Where water lines were available, rail rates were reduced accordingly. No one questioned the railways' right to do this, any more than they questioned their right to meet the rate of a competing railway. So firmly was this fixed in the rate structure that in the interstate commerce act of 1887 the continuance of special rail rates to meet water competition was specifically authorized.

The period from 1875 to 1900 saw the rapid decline of inland water transportation, except on the Great Lakes. Waterway advocates assert that the driving out

of the steamboat by the railway was not a case of the survival of the fittest, but was due to unfair competition. The railway, even at that day, however, had great advantages over the waterway, apart from the question of relative rates. It is important to the shipper of freight that a carrier shall be responsible and shall give regular service. In its best days the river steamboat could not compete with rail service in these particulars. The water transportation line is subject to interruption by floods and by drought. The ice in winter in northern latitudes puts it out of business entirely during several months of the year. The risks of loss are many times as great as on goods sent by rail. These and other conditions, which will be more fully discussed later, greatly handicapped the water route in the competition.

The closing decade of the century was a period of great agitation among those who sought to maintain the position of water transportation. The idea of water-route competition benefiting the public had become firmly fixed. Congress undertook appropriations for waterway improvements on a larger scale than ever before.

President Roosevelt's Advocacy of Waterways

At the close of the century practically all of the old inland canals had either been abandoned or had lost all commercial importance, except the Erie Canal, owned by the State of New York. This was so dilapidated, and traffic on it was so rapidly declining, that it was clear that this canal also was rapidly becoming obsolete. This was the situation that confronted Theodore Roosevelt when he became Governor of New York after the Spanish War; and he appointed a commission to investigate and report what action the state should take.

The commission recommended the reconstruction of the Erie Canal as a large barge canal, at an estimated cost of $101,000,000. That work was undertaken and is now practically completed.

The interest in waterway development which Colonel Roosevelt acquired at that time was doubtless one factor which led him to devote such energy to the Panama Canal enterprise when he became President. He also became strongly impressed with the waterway propaganda then current, and lent the influence of his magnetic personality to furthering waterway development. In 1907 he appointed an Inland Waterways Commission "to prepare and report a comprehensive plan for the improvement and control of the river systems of the United States."

The commission was largely made up of men identified with the Roosevelt policies, and committed to a considerable extent to the current agitation in favor of water-transportation development. It was not to be expected that a commission so constituted and appointed with such instructions would bring in a report in any way antagonistic to waterways. The commission, however, in the face of the facts which were revealed by the investigations of its experts, could not lay out and recommend for adoption any such great system of inland waterways as was doubtless expected at its creation. Instead, it recommended the establishment of a permanent Government body to plan systematically for waterway development. The report also contained intimations that a considerable part of the waterways system existing and planned was of doubtful value—to put it mildly. One notable clause in the report read:

"We recommend that any plans for improving the inland waterways shall take account of the present and prospective relation of rail lines to such waterways and shall ascertain, so far as may be, whether such waterways when improved will be effectively used in the face of railway competition."[2]

At the time when this report was rendered Congress and the President were at loggerheads. The report of the commission, which was appointed by the President without authority from Congress and which had no appropriation to pay for its work, had little influence with the legislators at the capital, and no action was taken on the Inland Waterway Commission's recommendations.

The only attempt which the Government has ever made, therefore, to investigate the water transportation situation (and even this was not a broad, unprejudiced investigation) has had little or no influence on its action. The Government has since pursued its work of waterway development as it always has done, without any systematic plan or policy. A waterway commission provided in the rivers and harbors bill of 1917 was never appointed by President Wilson.

The Organized Promotion of Waterway Projects

The chief influence which has controlled the Federal appropriations for waterways is the organized propaganda in favor of such appropriations which has been carried on in wholesale fashion for many years. This propaganda has been successful in creating a widespread public opinion in favor of waterways. The public, and especially the commercial interests, implicitly believe that the waterway is inherently a cheaper means of transport than the railway, and that the provision of a waterway at Federal expense will therefore benefit the adjacent shippers and communities. Commercial organizations, therefore, can usually be officially enlisted in favor of waterway appropriations. Others active in promoting waterways are those interested in steamboat lines and in contracts for work on waterways. Still more influential are the interests which seek to have the Federal Government improve rivers ostensibly for navigation, but actually for flood protection.

With this pressure behind Congress, it is entirely natural that appropriations for waterways have been liberal. The individual Congressman has no means of sifting the claims made by the waterway promoters, and he has not the technical knowledge needed to uncover fallacies in the arguments presented. Very little attempt has been made to expose these fallacies. Arguments against waterway appropriation have been generally combated by the waterway promoters with the charge that the objector was "working for the railway interests."

There has thus grown up in the public mind the belief that advocacy of waterways and defence of water transportation are closely related to advocacy of public interests instead of private interests; of free competition in transportation rather than monopoly; of conservation and utilization of natural resources for the public benefit.

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[2]A report on transportation by water in the United States was made by the Commissioner of Corporations at about the same time as the Inland Waterways Commission's report. This report was largely inspired by the theory that the cause of the decline of water transportation was the lack of proper terminals for freight handling, and especially the control of water terminals by railways. Neither of these investigations, therefore, was undertaken as a broad, unprejudiced study of the water-transport situation; and it is easy to detect in the reports the personal views of individual members. Nevertheless, these reports and the studies by expert investigators which accompanied them are the most nearly complete and valuable record of water-transport conditions in the United States that has ever been made.

This is so well recognized that a necessary plank in most political platforms for many years has been a declaration in favor of waterways. The candidate for public office feels sure of approval when he throws into his speeches a few ringing sentences urging improvement of the waterways and condemning the railways. It would be useless for him to pursue any other course. Were he to voice a doubt as to the soundness of the lavish expenditure on waterways, he would be assailed on every hand with quotations from many supposed authorities, all proving him in the wrong, and grave doubts of his sincerity and honesty would be at once aroused.

III—Changes During the Past Twelve Years

When the Inland Waterways Commission made its investigation a dozen years ago, it was taken for granted that the inland waterways ought to be improved and put into use. There were at that time enough of the old-time river steamboats still running on Western rivers to encourage the belief that inland water navigation might be revived and again become important. The cry had long been, Let the Government improve the channels, and the commerce will follow. The channel improvements had made great progress, and speedy results were looked for.

These results have not materialized. Instead of a revival of water transportation, there has been a continuous decline. The great expenditure of the Government on channel improvement has had, broadly speaking, no results. On the improvement of the Mississippi River below Rock Island, Ill., the Government has spent about $100,000,000, though, to be sure, a large part of this went into flood protection. The Mississippi is deeper, and better for navigation, than the Rhine, Europe's greatest interior waterway. Yet the Mississippi has been practically deserted by through traffic. On that river and most of its tributaries, on many of which the Government is still building and maintaining costly works for channel improvement, the few boats which remain are carrying local business only.

The official statistics giving the tonnage of waterborne commerce on inland rivers are misleading, because many inland rivers are still extensively used for floating logs and timber, and also because of the great increase in the use of rivers as a source of sand and gravel. To credit the Government's channel improvement works with the tonnage of logs floated downstream and with the tons of sand and gravel dredged from some nearby bar and towed a mile or two to a convenient site for unloading, is absurd. In most cases the sand and gravel would have been as easily obtained and the logs would be as readily floated with the river in its natural condition.

The various "projects" under which improvements of inland rivers are now being prosecuted were adopted in most cases many years ago. Many projects had their first inception during the '80s or '90s, when the country had just become aroused to the fact that the river steamboat was yielding to railway competition, and when the public demand was urgent that the waterways should be improved to hold their own with the railways. Where projects have been revamped it is generally with the idea of reconstruction on a larger scale. Very seldom has the question been squarely faced whether the time had not passed when the channel could be profitably used for navigation.

Probably the most powerful influence back of the campaign for Federal expenditure on waterways has been that of the property owners in the Mississippi valley. One of the most valuable public improvements of the last half century is the reclamation of the fertile lands along the Lower Mississippi River by the construction of levees and bank revetments, to protect the land from floods and make permanent the channel of the river. A large part of the money for this work has been supplied by the Federal Government; but its expenditure has been made ostensibly for the improvement of navigation. Three years ago a new precedent was established, and Congress made a direct appropriation for flood prevention on the lower Mississippi River. Thus one of the chief sources from which the propaganda in support of river appropriations has been financed has now been removed, and there is that much better chance of having the case of the waterways considered fairly on its merits.

No change during the past dozen years has been of greater importance in its bearing on the waterway question than the altered situation of the railways.

From the time when competition of the railway with the steamboat first became evident, the argument has been potent that waterways were a public necessity to keep down railway rates. That argument had its birth in the days when belief in railway competition as a necessary protection to the public was still almost universal. Better even than railway competition, it was held, was water competition, because steamboat lines could not be combined and controlled like competing railway lines.

Good Results From Government Railway Control

Of course, this argument for waterways became invalid when the Government established its direct control over railway rates. There still remained, however, a widespread belief in the value of water competition. Not until the recent transfer of the railways to Government control and operation has the public been able to view this matter in its true light.

It is now clear to everyone that the railways must have rates high enough to live on and continue operation; and not only that, but enable them to expand and develop to meet the country's necessities. If rates are insufficient for this, the deficit will have to be made up from the public treasury with money raised by taxation, as is actually being done today. If the dream of some of the waterway promoters were realized and "a comprehensive system of waterways" were constructed, and if that system operated to reduce railway rates, the deficit to be made up by the taxpayers would be that much larger.

One finds repeatedly in waterway literature the argument that waterways would be justified even if they were wholly unused, merely because of their influence in reducing railway rates. The present situation of the railways shows the absurdity of this reasoning. If the waterways were able to divert from the railways a large amount of business which the railways could handle at a profit, the deficit for the taxpayer to shoulder would be even greater.

Thus the great experiment of Government railway control, undertaken for the war emergency, has been a most valuable demonstration that the railway, as an absolute public necessity, must have rates high enough to enable it to live, and that any water transport line

to be usable by vessels of 8-ft. draft, and is already available for such vessels over most of the distance, cannot be so improved as to be usable by deep-draft ocean freight vessels. If anyone doubts this, attention need only be directed to that portion of the river from Cairo to the sea. This is the ancient delta of the river. Rock lies at an unattainable depth. The slope down which the river flows is so steep that the river finds stability only by lengthening its course and flowing in a succession of sharp bends. When the river is in flood its depth would be sufficient at most points to float ocean steamers, but such vessels have not steering power to cope with the swift current and sharp bends.

During a large part of every year, dry weather prevails over the Mississippi basin, and the river shrinks away to proportions so small that only by the dredging of channels across the bars during the low-water season is the river made usable by steamboats of 8-ft. draft. By no practicable method known to engineers would it be possible to secure a sufficient depth for deep-draft ocean steamers in the Mississippi from Cairo to the sea during the low-water season.

What Can Be Done on 8-Foot Draft?

The literature on waterways which has been poured forth so profusely for many years is so largely based on false assumptions and profound ignorance of practical commercial conditions that it is no wonder the general public, and even many engineers, have fantastic ideas on this subject.

One of the fallacies which has been most diligently spread abroad is that a "deep" waterway is necessary for economical inland navigation. It is worth while to consider this matter briefly.

For ocean navigation, depth of hull is essential to a large-size vessel; a long hull of small depth lacks the necessary strength as a girder to resist the stresses when wave crests far apart lift the hull.

For inland navigation in protected waters, large capacity may be given to a vessel by making the hull broad and shallow. Contrary to the general belief, such a vessel can transport cargo just as economically as the deep-draft ocean vessel, and in many cases at even lower cost. Such vessels are very cheap to build per ton of capacity compared with ocean vessels. Built as barges and propelled in fleets by a single power boat, they are cheaper to operate per ton-mile transported than is an ocean steamer.

Besides this, the shallow draft vessel can be loaded with general cargo or discharged at much less expense than a deep draft ocean vessel, given proper equipment in each case. The cargo in an ocean vessel must be carefully sorted, the heaviest articles at the bottom, the lightest on the top. The cargo must be dropped into or taken out of the hold by hoisting tackle and must be carefully placed, so that injury will not occur from piling goods on top of each other.

With the shallow-draft boat, on the other hand, the load is spread out over a large area, and no such expert work in sorting and stowing is necessary as in loading an ocean steamer.

Of course, a "deep" waterway is essential for channels which have to accommodate lake or ocean vessels built to stand rough weather. For use by barges which traverse waters where some seaworthiness is essential, reasonable depth is also desirable.

But where, as at New Orleans, a cargo must be transferred from an ocean steamer to another craft anyway if its journey is to be continued inland by water, it is doubtful whether there would be any material gain in economy by using a vessel of 14-ft. draft instead of one of 8 or 9 ft. There certainly would not be if the larger cost of making and maintaining the waterway which the boat of deeper draft would require were taken into consideration.

For years the "slogan" of the Lakes to the Gulf deep waterway advocates, when they realized that the project for a ship canal was chimerical, was, "Fourteen Feet Through the Valley." It is an excellent illustration of the slender basis of fact and knowledge on which the waterway agitation was conducted that nobody ever attempted to find out whether a river boat could handle traffic at materially lower cost on 14-ft. depth than on 8- or 9-ft. The mere theoretical supposition that the cost of water transport decreased with increase of depth was sufficient!

The Ohio and Mississippi Navigation

The projects on the Atlantic Coast and between that coast and the lakes which have just been reviewed are all projects for linking up waterways already existing and largely used. Can anything be done to restore water transport on inland rivers? The United States will shortly have spent about $200,000,000 on the improvement for navigation of the lower Mississippi and the Ohio Rivers. It is no longer a question whether it is worth that sum to preserve navigation there. That investment is made anyway and is lost except as benefit may accrue through the use of these rivers for transportation. Their use by the old-time craft and old-time methods is gone, never to return. Can newer methods take their place?

Notwithstanding the disheartening experience of the Inland Transportation Co., reviewed in a previous chapter, and of the practical disappearance of the river as a competitive factor in transportation, there is a chance that the Mississippi may again become an important waterway—and perhaps the Ohio also—provided the task is undertaken with a clear knowledge of commercial requirements.

New Orleans is the most convenient seaport for the entry of goods from tropical America—bananas oranges, and other tropical fruits, coffee, cocoa, sugar, hides, etc. The ocean steamers which tie up along the riverfront at New Orleans can transfer their cargo to river barges lying alongside even more cheaply probably than they can to railway cars. These river barges, drawing, say, 8 ft. of water, can deliver such cargo at St. Louis in two to four weeks. The cost per ton of the transfer from steamer to barge at New Orleans should not exceed 50c. Where automatic machinery is used for handling it may be considerably less. The cost per ton-mile for transport up the Mississippi to St. Louis, if the traffic is handled in large volume, ought not to exceed one mill per ton mile.

It may be possible, therefore, by present channels and present craft, to bring an ocean vessel's cargo to St. Louis, far in the heart of the continent, for a cost of probably $1.50 per ton added to the ocean freight rate.

At St. Louis there is under construction the first large municipal river terminal undertaken on the Mississippi, a reinforced-concrete wharf extending along the

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river front for about 900 ft. The structure is 40 ft. in height, with its floor a little above high-water mark. At ordinary stages of the river, therefore, all cargo has to be hoisted 20 to 30 ft. to the pier floor. Cargo may be thus hoisted out with cranes, or inclined elevators may be run up the slope of the river bank. Railway tracks are provided for in the plan, and a belt line of railway has been recommended to enable cars loaded or discharged at the pier to pass to any railway entering the city.

If this terminal proves to be adapted to the work for which it is designed, the way will then be clear for a demonstration of what water transport on the Mississippi from New Orleans to St. Louis can accomplish in economical traffic movement.

The success of this experiment will depend not alone on the boats used and the transfer facilities at each end, but on the organization for carrying on the entire enterprise. In order to be successful, it must handle a large volume of traffic; only by so doing can it justify the investment the city has made in the terminal, to say nothing of the millions the Government has spent on the river and recently on the boats. As has already been pointed out, only by handling a large volume of traffic can an organization of terminal labor be maintained able to handle the cargo cheaply and efficiently.

To handle a large volume of traffic the river route must have the hearty coöperation of the railways and of the shippers. The prosperity of the boats depends largely on the return freight. The railways have great power to divert return freight to or from the boats and to obstruct the movement of freight brought by the boats, through their control of freight-car movements.

If the volume of traffic at St. Louis demonstrates the success of its river terminal, similar structures are likely to be erected by various cities along the Mississippi and Ohio Rivers. Caution is needed here, however. Few river cities can furnish or absorb a sufficient volume of traffic to justify the outlay for the costly terminal and the machinery required to handle freight from a river with 50-ft. to 70-ft. variation in level, or to furnish labor for the operation of such a terminal, ready to handle barge loads without delaying traffic. St. Louis is more favorably situated than are Ohio River cities, also, because interruption of traffic by ice in winter is very short and there are no locks to pass on the voyage.

It is hardly too much to say that the future of inland river transport in the United States depends on the results obtained by the water transport line which the Government has established between St. Louis and New Orleans. Until it is shown that business can be made profitable on this route, no more money should be spent on the improvement of waterways where the traffic possibilities are known to be far inferior.

The fact hitherto emphasized, that movement by rail in and about large cities is extremely costly, brings prominently forward an advantage of water transport facilities which has been seldom mentioned. Take, for example, transportation in the vicinity of Pittsburgh. The congestion of the railway tracks in the Pittsburgh district makes transfer of freight by rail for even a few miles very costly. A river barge can transfer freight between a plant on the Monongahela and one on the Allegheny, if both have terminal facilities on the water front, more cheaply and often more promptly than the transfer can be made by rail.

Still more marked is the great advantage of the labyrinth of waterways which constitute the port of New York, in giving a means of direct shipment between any two points on the entire waterfront. An eminent engineer once compared this great extent of waterways to a railway switching yard, costing nothing to maintain, in which a car could be moved from any point to any other point directly, without the great labor and expense necessary where cars are sorted in a railway yard. Here is a case where the local water transportation is saving many millions of dollars annually in the transfer of goods over short distances compared with the cost of moving them on land, either through the streets or on railway tracks. It is very likely that the saving by this local water transportation exceeds the saving made by the water transport on all the inland rivers in the United States.

This is of course merely an extreme illustration of the point here repeatedly emphasized, that terminal conditions and not local conditions determine the cost of transport and the economical route.

A Plea For a Broad View

In conclusion, let it be emphasized that the object of the preceding discussion is not in any sense to oppose water transportation, but to urge that the question should be dealt with on sound engineering and economic principles. The business of the engineer, according to a famous definition, is "to make a dollar earn the most interest." The public funds expended for the development of transportation should be spent on the route or system which will furnish the needed facilities at the least total cost, and that cost must include all the items —not only the cost of the route, of the terminals, and of the equipment, with interest and depreciation allowances, but the cost of operation and the costs incurred by shippers and receivers. Only by such a broad analysis of the problem can a correct solution of the problem of economic transportation be reached and great waste of public funds be avoided.